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ON THE INTER-RELATION OF WIND DIRECTION AND CLOUD AMOUNT AT RICHMOND (KEW OBSERVATORY)

BY

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THE INTER-RELATION OF WIND DIRECTION AND CLOUD AMOUNT AT RICHMOND (KEW OBSERVATORY).

1. The following investigation was undertaken in order to determine whether any definite relation between wind-direction and cloud amount could be established, and further to determine the frequency of the clearing of the sky at night with winds from different directions. The most casual observer has noted the frequent clearing-up of the sky after sunset, in Autumn, with W. or S.W. winds, but hitherto no arithmetical measure of the frequency of this phenomenon has been available. It was thought that an estimate of the frequency of this night-clearing of the sky might be of some use to the forecaster who wished to predict the cloud amount.

2. The observations of wind and cloud at Richmond, for the years 1899-1913, for 10 h., 16 h., and 22 h. were used in the construction of the following tables. A table was constructed for each of these hours of observation for each month. In these tables, the columns represented wind directions, and the rows cloud amounts 0 to 10, so that each compartment represented a definite cloud amount associated with a definite wind direction. Each observation of wind and cloud was represented in the table by a dot in the appropriate compartment. These dot-diagrams were found to be rather instructive, and the distribution of the dots in the tables for the separate hours of observation showed very clearly, even at a casual glance, the diurnal changes in cloud amount. But for convenience in reproduction the dots in each compartment were replaced by the total number of the dots, and a further abridgment was obtained by reducing the number of classes of cloud amount, substituting the usual code figure for the state of the sky. In this notation—

0	represents	cloud	amount	0 or 1
1	,,	,,	,,	2 or 3
2	,,	,,	,,	4, 5, or 6
3	,,	,,	,,	7 or 8
4	,,	,,	,,	9 or 10

Fog frequencies are represented in a fifth class.

It will be seen from the tables that the total number of observations in any month differ for the different hours of observation. This is due to some observations not having been made. The tables contain all the available observations for each hour.

3. An examination of the tables shows that November, December, January, February, and March can be grouped together in a well-marked winter type, which shows little change

in the frequency distribution from month to month; while May, June, July, August, and September can be grouped together in a summer type. April and October represent periods of transition, the latter in particular representing a very rapid change from summer to winter, while the former represents a slower change.

The first outstanding feature of the tables is the frequency of S.W. and W. winds, which form about 50 per cent of the total, these winds being due to the passage of depressions across the British Isles. The second outstanding feature is the very strongly marked increase in the number of skies represented by 0, in the tables for 22 h. The last columns of the tables show that the frequency of the sky 0, is about 3 times as great at 22 h. as at any other hour of observation during the "summer" months, and nearly twice as great during the "winter" months. Generally speaking, the sky is less frequently clear at 16 h. than at 10 h., but by 22 h. the very marked improvement already mentioned has taken place.

4. Let us consider first the "winter" months, November to March. The cloudiest of these is December. The winds which are associated in general with the near approach or passage of a depression, *i.e.*, SE., S., and SW. winds are predominatingly overcast by day, though they show rather less cloud by night. N., NE., and E. winds are also predominantly overcast by day, and nearly so also by night. It will be noted that winds having a Westerly component are on the whole less cloudy than those having an Easterly component, and at the same time they show a much stronger tendency to clear up at night. A striking feature brought out by the tables is the relative infrequence of half-clouded skies at night. It appears that in general if the sky is half-clouded during the day it will either clear up or become completely overcast by night.

The April observations show no considerable deviation from the winter conditions by day, but the 22 h. observations show a much more marked tendency to clear up at night. SE. and S. winds, which during the winter months give very cloudy skies for all the hours of observation, now show a well-marked tendency to clear at night.

5. May marks the beginning of the "summer" type. There is a striking decrease in the frequency of overcast skies, for all hours of observation, and a considerable increase in the number of clear skies at night, for all winds.

But with winds having a Westerly component the number of cases of nights with cloud amount 2 to 8 is fairly considerable, except in September. It is probable that during the summer months the mean cloud amount, and also the frequency of cloud amounts 2 to 8, would be less at midnight or 1 a.m. than at 22 h. In winter the clearing of the sky takes place soon after sunset, but possibly in summer, on account of the greater heating effect of the sun by day, the clearing of the sky does not take place for some hours after sunset.

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6. It is instructive to consider each wind direction separately.

(*a*) N. winds are generally cloudier in the afternoon than in the morning, but less cloudy at night than in the day. The night clearing is shown at all times of the year, but is very slight in December, and rather strongly marked in summer.

(*b*) NE. winds are very cloudy at all times, but are slightly less cloudy by night than by day.

(*c*) E. winds are very cloudy in November, December, and January, when they show no appreciable decrease of cloud at night. In February they begin to show a decrease in cloudiness, which is continued into the summer months. From April to September the number of clear nights exceeds the number of cloudy nights with these winds, August being the least cloudy of all the months.

(*d*) SE. winds are very cloudy for all months, but they show a slight tendency to clear at night from February to September.

(*e*) S. winds are also very cloudy for all months, and only show a marked improvement at night in September.

(*f*) SW. winds are generally cloudy, as they are associated with the passage of depressions. The improvement at night is appreciable for all months, but is very considerable from July to October.

(*g*) W. winds are very cloudy by day, from March to September, but considerably less cloudy by day during the winter months. The increase in the number of clear skies at night is very marked in August and September.

(*h*) NW. winds are very cloudy by day at all times of the year, and are least cloudy in January and February. The decrease in cloud amount by night is appreciable at all times of the year.

The most striking cases of diurnal changes in cloud amount are shown by:—

(1) E. winds, particularly during August.
(2) SW. winds from July to October.
(3) W. winds during all months, particularly during August and November.

7. The direct application of the results described above, to the forecasting of cloud amount, is not perhaps a simple matter, as the application of statistical results to a concrete example always demands great caution. But they can be of considerable aid in forecasting cloud amount by night when taken in conjunction with the synoptic chart of the day, and carefully made observations of the clouds. It is possible to forecast the wind direction with considerable accuracy some time ahead. When the wind direction has been forecasted, an examination of the tables given below for the month in question will show whether that particular wind direction tends to give clear skies at night. For most wind

directions at all times of the year it is found that the observed cases fall into two well-defined classes of clear, and overcast skies, and the relative proportions of these classes gives an *a priori* probability for a clear sky for the night in question. The forecaster can determine from an examination of his synoptic chart whether the approach of a depression, or some other barometric change, gives a certainty of an overcast sky at night, but if there is no such indication on the synoptic chart, he can at any rate conclude that there is some probability of a clear sky. A careful examination of the nature and apparent thickness of the cloud-layer will as a rule enable him to decide whether the sky will clear or not after sunset. If the afternoon cloud is not dense, it will as a rule dissipate at night, whereas a dense layer of stratus will in general persist, or, if it clears, it only does so some hours after sunset. With practice it becomes possible to acquire considerable facility in forecasting even the length of the clear intervals at night.

8. It will be noticed that during the winter in particular, winds on the East side of the N.S. line give very cloudy skies at Richmond. This fact gave rise to some doubts as to how far the apparent cloudiness at Richmond might be due to the effect of the gathering up of the smoke of London by such winds. In order to decide this a comparison of the cloud frequencies at Richmond with those at Greenwich, was carried out for the months of January and July, which can be regarded as typical of the winter and summer months respectively. If London has any considerable effect on the cloudiness of Richmond with Easterly winds, then it might be expected that with E. winds Richmond would be cloudier than Greenwich, and with W. winds Greenwich would be cloudier. The Greenwich frequency tables are given below for the months of January and July, for the years 1903-1912. Only ten years of Greenwich observations were reduced, owing to the difficulty of finding time to do the work. In order to compare the Greenwich figures with those for Richmond, it is necessary to increase the former by 50 per cent. The tables are here given in their original form for 10 years, and it is left to the reader to allow for the different periods of time covered by the observations for the two places. The comparison of the two sets of tables may be briefly summarised as below:—

(*a*) In January Greenwich is on the whole less cloudy than Richmond, but the differences are not very marked. During the day Greenwich is less cloudy than Richmond with E. winds, and cloudier with N., NE., and N.W. winds. At night the only distinct difference between the two places is shown by SW. winds, with which Greenwich is less cloudy than Richmond.

(*b*) In July Greenwich is again on the whole less cloudy than Richmond. With N., NE., and E. winds Greenwich is cloudier than Richmond by day, and less cloudy by night. Greenwich is also the less cloudy of the two stations by night with SW. winds.

The differences between the two stations are not always in the direction one would have anticipated, but they are never sufficiently great to be of importance. But the differences which do exist are not to be accounted for simply as the effect of London smoke. The resemblance between the two sets of tables is sufficiently great to justify the application of a forecast of cloud amount for Richmond also to the Thames Estuary.

9. The frequency of fog is also shown in the tables, but little can be added on this point. It will be noted, however, that October is the foggiest month, and November comes second to it.

The writer hopes to return at a later date to the further consideration of the questions raised above, and in particular to compare the distribution of cloud frequencies at Richmond with similar data for some central European stations.

The theoretical basis of the clearing of the sky at night will be found in a paper by Sir W. N. Shaw in Journal Roy. Met. Soc., Vol. XXVIII., also reproduced in Forecasting Weather. pp. 175-183.

pp. 253 et seq.

Frequencies of Wind Direction and Cloud Amount at Richmond (1899–1913).

Cloud Index	10 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	16 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	22 h. Calm	N	NE	E	SE	S	SW	W	NW	Total
JANUARY.																														
0	1	11	10	8	2	3	4	20	10	69	—	7	9	7	2	1	6	5	12	49	—	14	13	7	6	5	17	28	19	109
1	—	1	—	—	1	3	10	11	3	29	—	2	2	3	2	1	5	11	7	33	—	1	1	1	3	3	7	14	3	33
2	—	1	—	1	2	3	7	9	5	28	—	3	1	1	4	3	10	11	1	34	—	1	2	2	—	1	2	9	—	17
3	—	4	5	3	2	2	11	8	3	38	—	6	6	3	2	4	13	18	10	62	—	4	—	2	1	4	14	8	2	35
4	—	18	23	26	21	39	77	64	12	280	—	10	16	21	19	23	58	59	13	219	—	9	16	25	30	29	68	43	14	234
Fog	—	5	3	2	2	1	3	3	—	19	—	1	1	3	1	—	—	1	—	7	—	2	1	3	—	—	1	—	—	7
Total	1	40	41	40	30	51	112	115	33	463	—	29	35	38	30	32	92	105	43	404	—	31	33	40	40	42	109	102	38	435
FEBRUARY.																														
0	—	11	5	10	3	3	4	15	10	61	—	5	4	6	4	2	2	5	5	33	—	16	10	16	10	5	25	20	19	121
1	—	1	2	—	—	1	4	7	6	21	—	6	3	2	5	2	5	8	7	38	—	3	3	3	—	4	8	5	2	28
2	—	7	4	1	1	4	2	14	5	38	—	3	9	1	1	3	7	8	11	43	—	1	—	—	—	6	3	2	7	19
3	—	8	3	6	3	4	15	13	9	61	—	2	8	1	3	6	15	15	10	60	—	1	1	—	3	1	5	5	3	19
4	1	30	28	14	12	36	65	31	10	227	—	27	18	14	14	29	48	39	18	207	1	23	33	20	13	27	54	37	21	229
Fog	—	1	2	3	2	2	—	3	1	14	—	—	—	1	—	—	—	—	—	1	—	—	1	—	—	1	1	1	—	4
Total	1	58	44	34	21	50	90	83	41	422	—	43	42	25	27	42	77	75	51	382	1	44	48	39	26	44	96	70	52	420
MARCH.																														
0	—	11	5	10	5	3	9	9	2	54	—	4	—	5	5	1	6	2	2	25	—	16	16	11	8	13	37	19	23	143
1	—	3	2	—	2	2	8	5	5	22	—	5	—	2	2	1	6	7	2	25	—	3	6	1	3	2	7	6	4	32
2	—	9	4	—	1	3	10	11	9	47	—	7	8	2	3	4	18	16	12	70	—	—	3	1	1	5	6	3	2	21
3	—	9	8	2	2	8	13	12	8	62	—	15	9	3	3	8	17	15	10	80	—	1	2	—	—	3	6	5	3	20
4	—	34	47	24	9	27	74	37	15	267	—	28	38	13	7	21	56	28	18	209	1	32	33	21	9	36	71	20	15	238
Fog	—	—	1	8	2	—	1	1	—	13	—	—	—	3	—	—	—	—	—	3	—	—	—	4	—	—	—	—	—	4
Total	—	66	67	44	21	43	110	75	39	465	—	59	55	28	20	35	103	68	44	412	1	52	60	38	21	59	127	53	47	458

Frequencies of Wind Direction and Cloud Amount at Richmond (1899–1913)—*continued.*

Cloud Index	10 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	16 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	22 h. Calm	N	NE	E	SE	S	SW	W	NW	Total
APRIL.																														
0	—	5	13	7	9	4	4	6	4	52	—	3	8	14	2	3	1	4	2	37	—	19	22	30	12	10	28	21	16	158
1	—	6	4	3	1	1	4	8	6	33	—	5	4	2	—	3	1	2	3	20	—	6	8	1	4	3	9	13	4	48
2	—	7	6	2	4	3	11	11	9	53	—	17	4	5	2	7	15	22	10	82	—	6	6	1	2	7	6	2	4	34
3	—	16	12	7	3	7	8	13	11	77	—	12	11	4	4	10	11	17	10	79	—	1	6	1	—	6	9	4	3	30
4	1	38	35	10	10	23	56	37	23	233	—	26	24	14	6	21	46	18	21	176	—	24	28	17	7	18	44	31	12	181
Fog	—	—	1	—	—	—	—	1	2	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	1	72	71	29	27	38	83	76	55	452	—	63	51	39	14	44	74	63	46	394	—	56	70	50	25	44	96	71	39	451
MAY.																														
0	—	13	9	9	1	3	12	1	—	48	—	7	10	10	1	2	2	4	2	38	—	20	38	24	7	13	40	20	13	175
1	—	4	8	2	2	3	6	4	4	33	—	7	5	4	1	4	7	4	2	34	—	1	4	5	2	3	9	7	2	33
2	—	13	9	4	2	5	8	17	5	63	—	7	10	4	2	7	7	11	6	54	—	2	—	5	2	5	10	5	1	30
3	—	23	15	3	1	16	21	20	6	105	—	15	13	8	5	11	22	13	11	98	—	6	2	3	1	4	10	6	1	33
4	—	42	25	24	11	22	45	27	16	212	—	35	18	16	5	19	46	31	12	182	—	31	35	24	9	19	44	17	12	191
Fog	—	—	2	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	95	68	42	17	49	92	69	31	463	—	71	56	42	14	43	84	63	33	406	—	60	79	61	21	44	113	55	29	462
JUNE.																														
0	—	6	16	11	2	7	2	1	1	46	—	1	11	13	2	2	—	1	3	33	—	10	14	23	7	14	27	17	10	122
1	—	3	7	5	1	1	4	4	2	27	—	7	5	4	2	1	6	2	—	27	—	9	7	12	1	6	12	7	3	57
2	—	13	9	2	3	6	18	10	8	69	—	13	14	4	5	7	18	18	12	91	—	6	3	2	1	4	4	9	7	36
3	—	8	6	5	2	12	16	11	9	69	—	9	8	7	3	2	28	20	10	87	—	5	3	4	2	3	9	6	3	35
4	—	33	49	10	7	15	55	46	21	236	—	21	24	11	11	20	35	25	12	159	—	31	29	27	10	10	47	34	10	198
Fog	—	—	—	—	1	1	—	—	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	63	87	33	16	42	95	72	41	449	—	51	62	39	23	32	87	66	37	397	—	61	56	68	21	37	99	73	33	448

Frequencies of Wind Direction and Cloud Amount at Richmond (1899–1913)—*continued.*

Cloud Index	10 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	16 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	22 h. Calm	N	NE	E	SE	S	SW	W	NW	Total
JULY.																														
0	—	10	12	14	6	3	11	6	3	65	—	6	8	7	2	1	7	3	1	35	3	20	16	28	6	7	40	17	13	150
1	—	5	2	1	1	4	7	3	2	25	—	7	2	4	3	5	9	3	3	36	—	7	3	7	4	3	17	14	11	66
2	—	15	7	7	3	5	9	20	13	79	—	11	3	6	—	7	17	27	14	85	—	3	—	3	1	—	12	10	3	32
3	—	9	7	4	2	6	18	23	16	85	—	14	3	5	3	9	36	26	14	110	—	4	1	7	—	1	20	9	5	47
4	1	39	18	8	4	11	68	42	18	209	—	23	15	8	—	11	36	24	26	143	3	27	15	15	6	14	51	28	18	177
Fog	—	—	1	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	1	78	47	34	16	29	113	94	52	464	—	61	31	30	8	33	105	83	58	409	6	61	35	60	17	25	140	78	50	472
AUGUST.																														
0	—	4	5	17	6	4	2	9	2	49	—	6	7	14	3	7	—	3	2	42	2	12	11	37	14	8	49	37	12	182
1	—	2	7	7	3	4	4	6	2	35	—	5	5	4	1	4	6	5	3	33	—	1	8	2	1	2	17	15	6	52
2	—	6	4	4	—	12	27	22	7	82	—	6	5	5	2	10	24	27	13	92	—	5	3	2	1	—	15	12	5	43
3	—	7	3	6	3	7	24	33	13	96	—	6	4	4	1	8	21	16	15	75	—	5	1	1	1	2	12	10	5	37
4	—	27	15	8	7	32	63	34	16	202	—	22	6	8	6	27	53	29	18	169	—	21	5	15	4	20	52	26	8	151
Fog	—	1	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	47	34	42	19	59	120	104	40	465	—	45	27	35	13	56	104	80	51	411	2	44	28	57	21	32	145	100	36	465
SEPTEMBER.																														
0	—	4	4	13	10	9	11	6	6	63	—	4	3	20	2	8	4	4	5	50	4	22	26	29	6	20	26	27	26	186
1	—	13	2	6	4	1	4	10	5	45	—	6	—	5	5	8	5	6	6	41	—	4	4	2	2	9	13	9	3	46
2	—	11	12	11	9	4	10	9	10	76	—	14	8	4	4	8	12	17	19	86	—	6	3	3	1	3	3	6	2	27
3	—	11	11	5	1	8	9	9	12	66	—	12	13	10	5	7	14	8	6	75	—	8	6	—	6	1	8	3	3	35
4	1	33	36	15	12	15	40	28	16	196	—	24	18	13	8	14	30	20	16	143	1	29	31	21	7	15	24	18	9	155
Fog	—	—	—	1	1	—	1	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	1	72	65	51	37	37	75	62	49	449	—	60	42	52	24	45	65	55	52	395	5	69	70	55	22	48	74	63	43	449

Frequencies of Wind Direction and Cloud Amount at Richmond (1899–1913)—*continued.*

Cloud Index	10 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	16 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	22 h. Calm	N	NE	E	SE	S	SW	W	NW	Total
OCTOBER.																														
0	1	10	5	6	2	1	10	15	5	55	1	6	2	11	1	6	4	2	5	38	5	18	8	24	7	13	32	20	13	140
1	—	3	3	—	1	3	6	2	3	21	1	1	3	3	1	5	7	9	5	35	1	5	2	4	1	7	8	8	8	44
2	1	2	1	10	2	6	17	11	9	59	1	5	5	6	4	7	15	18	6	67	2	1	1	1	3	5	4	8	1	26
3	—	3	4	8	5	7	16	11	7	61	—	6	3	8	2	12	17	11	14	72	—	3	3	4	1	6	8	3	4	32
4	—	27	29	25	13	44	52	25	20	235	1	24	19	12	14	37	51	17	16	191	1	25	24	17	8	38	53	26	14	206
Fog	2	4	1	12	2	6	3	2	2	34	—	—	1	1	—	—	—	—	—	2	3	1	—	4	1	2	1	—	—	12
Total	4	49	43	61	25	67	104	66	46	465	4	42	32	41	22	67	94	57	46	405	12	53	38	54	21	71	106	65	40	460
NOVEMBER.																														
0	—	5	11	5	1	—	10	18	3	53	3	8	7	4	1	3	5	8	8	47	2	15	9	6	4	8	15	34	14	107
1	—	1	4	2	1	1	5	6	4	24	—	3	3	1	2	2	7	7	5	30	—	4	5	1	1	2	9	6	3	31
3	—	3	3	1	—	1	11	13	8	40	—	3	—	3	2	2	14	23	7	54	—	1	5	2	—	1	7	2	3	21
3	1	4	4	4	1	7	16	8	2	47	—	4	3	3	—	6	12	11	7	46	—	1	2	2	1	3	5	9	5	28
4	2	20	32	24	18	27	70	49	17	259	3	20	36	13	21	27	51	45	9	225	2	19	23	25	14	32	64	30	23	232
Fog	2	1	2	5	1	3	4	5	3	27	—	—	—	3	—	—	1	2	2	8	3	1	1	3	—	2	3	3	3	19
Total	5	34	57	41	22	39	116	99	37	450	6	38	49	27	26	40	90	96	38	410	7	41	45	39	20	48	103	84	51	438
DECEMBER.																														
0	—	7	1	2	—	3	19	11	4	47	—	2	2	2	2	—	10	14	3	35	—	9	6	2	5	3	24	26	12	87
1	—	4	—	—	1	3	8	9	1	26	—	2	—	—	—	4	10	8	4	28	—	2	—	—	1	5	8	9	1	26
2	—	—	—	5	—	2	18	8	5	38	—	3	1	1	3	3	8	8	4	31	—	2	1	—	2	3	6	2	2	18
3	—	3	1	3	2	4	10	8	6	37	—	5	3	2	2	6	13	7	4	42	—	3	—	1	2	4	6	4	2	22
4	1	21	26	34	23	61	83	40	12	301	—	17	19	28	20	39	77	33	16	249	—	15	26	35	23	59	67	38	15	278
Fog	—	1	—	3	5	—	2	4	1	16	—	—	2	3	2	1	—	—	1	9	—	2	2	1	3	1	2	1	1	13
Total	1	36	28	47	31	73	140	80	29	465	—	29	27	36	29	53	118	70	32	394	—	33	35	39	36	75	113	80	33	444

Frequencies of Wind Direction and Cloud Amount at Greenwich (1903–1912).

Cloud Index	10 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	16 h. Calm	N	NE	E	SE	S	SW	W	NW	Total	22 h. Calm	N	NE	E	SE	S	SW	W	NW	Total
JANUARY.																														
0	3	4	1	8	3	3	19	8	3	52	2	3	3	11	5	3	6	8	1	42	4	12	9	10	5	7	20	21	3	91
1	—	2	1	1	2	1	10	6	4	27	1	6	4	3	1	—	6	6	4	31	—	1	—	1	—	1	2	2	—	7
2	—	2	2	1	—	1	7	5	1	19	1	3	2	2	—	1	6	7	1	23	—	—	—	—	1	1	10	3	1	16
3	—	2	—	1	2	3	6	5	1	20	—	2	6	4	1	—	13	17	3	46	1	1	1	2	1	1	5	4	1	17
4	5	13	16	18	15	17	64	36	8	192	7	6	5	19	15	15	48	36	7	158	4	10	13	17	22	18	52	35	8	179
Total	8	23	20	29	22	25	106	60	17	310	11	20	20	39	22	19	79	71	16	300	9	24	23	30	29	28	89	65	13	310
JULY.																														
0	3	9	15	5	5	3	9	13	2	64	1	3	8	8	2	1	9	3	—	35	3	9	12	15	7	2	38	13	8	107
1	—	2	—	6	—	1	6	7	1	23	—	2	3	3	1	1	6	5	2	23	—	3	2	3	4	4	10	6	3	35
2	1	4	1	4	1	—	10	7	4	32	—	9	2	10	3	2	18	14	4	62	—	3	2	4	2	3	6	7	1	28
3	4	4	5	2	—	5	16	8	3	47	2	3	5	1	3	3	14	23	6	60	—	3	1	3	3	3	14	5	1	33
4	6	19	19	6	2	5	45	30	12	144	5	18	14	7	4	4	37	22	9	120	5	14	11	6	6	5	34	18	7	106
Total	14	38	40	23	8	14	86	65	22	310	8	35	32	29	13	11	84	67	21	300	8	32	28	31	22	17	102	49	20	309